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ANTERO-POSTERIOR CURVATURE OF THE SPINE.

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CHAS. F. STILLMAN, M.S., M.D.,
NEW YORK.

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ROUND SHOULDERS, OR ANTERO-POSTERIOR CURVATURE OF THE SPINE.

“ ROUND shoulders ” is one of the most prevalent deformities, and yet very little attention is paid by surgeons to its treatment, although it is amenable to curative measures with as little discomfort as any other prominent deformity.

An inquiry into its anatomical and physiological characteristics affords a clue to the treatment, that being the portion of the subject which more directly concerns us in this paper.

The spine, viewing it from the side, is a column composed of twenty-four segments, upon which rests the head, and to this column in its dorsal region is also attached the thorax, and secondarily the upper extremities. The normal line of the spine is a compound curve, and it is retained in this shape by muscles disposed along its course, acting as do the stays to a mast, and opposing the effect of the weight of the head as a constant gravital force to increase the curves. When the normal degree of tonicity does not exist in these muscles, this increase in the curves is found and is further exaggerated in the region of the neck and shoulders by the tendency of the upper extremities and thorax forward, and by this forward tendency we obtain the contracted chest, the separated and protruded shoulder-blades, and the bent and stooping shoulders, all characteristic of the deformity in this region.

But as the line of direction must be maintained, when the head drops forward the lower part of the trunk also projects itself, giving rise to the appearance of flat nates,

and causing it to appear as if the dorsal region projected very much backward beyond the normal line, as in Fig. 1.

The most common cause to which this deformity can be ascribed is muscular weakness, the inability of the back to recover the erect position after it has been relaxed. Relaxation of the back is the position of rest assumed by the trunk when the superincumbent weight is to be more fully borne upon the bodies of the vertebræ, and we then rely upon the ligamentous bands and attachments rather than muscular force to keep the body in this less fatiguing position ; thus relieving the muscles from all necessity of the contraction which is required if the trunk be maintained erectly. In this position of rest the spine curves backward in the shape of a bow, from the sacrum to the head, the centre of the bow being in the middle dorsal region, the bodies of the vertebræ being crowded together throughout the whole extent of the spine (see Fig. 3), and the muscles not exerting their contractile force.

When the erect position is again assumed, the muscles should restore the normal spinal curves so that the head and upper portion of the trunk, with their appendages, become supported in the proper line of direction (Fig. 2).

But if the muscles lack tone or are fatigued, or the patient is indolent, the position of rest becomes habitual and we have the production of round shoulders as the result.

There are various degrees and forms of the deformity, dependent upon the age of the patient, the length of the spine, the regional muscular development, the sitting habits, etc. ; but these are sufficiently known to every practitioner not to require description here. The projection forward of the head and nates is not found to the same extent in every case, but seems to be compensatory—to permit the line of direction to be passed somewhat anteriorly to its normal position, in order that the body may be properly balanced while in the vertical position.

The *treatment* which concerns us most directly in this paper, may be considered under two heads—*mechanical* and *physical*.

The *mechanical treatment* consists in the use of properly devised apparatus for the restoration and retention



Fig. 1.



Fig. 2.

of the normal curvature, and the mechanical problem this involves resolves itself into the reduction of the dorsal curve, since the cervical and lumbar are merely compensatory and will tend to regulate themselves.

We have already noted the fact that the exaggeration of the curves of the spine produces undue pressure upon the bodies of the vertebræ in the dorsal region, and we must, therefore, turn our attention first to placing the spine in such position as will tend to separate the bodies and transfer pressure to the other surfaces of contact in the normal degree. To effect this we utilize the principle of gravity as an extending force. When the patient assumes the horizontal position upon a table so arranged as to have its padded edge under the shoulder-blades, as in Fig. 3, and then allows the head and upper extremity to gradually fall backward and downward, we have produced a series of curvatures exactly opposed to those exhibited by the round shoulders. You will observe, as the patient's head and shoulders descend, a gradual obliteration of the condition of round shoulders and a reproduction of the normal curves of the spine. The bodies of the vertebræ become freed from the crowding to which they have been subjected, and a physiological and true extension of the parts is effected—the traction-force being the superincumbent weight, the cervical spine being placed in a state of extension by the weight of the head, and the dorsal spine in extension by the weight of the head, the neck, and the upper extremities. This combined weight, augmented by gravity, is simply tremendous as a traction or tractive force, and produces a true backward physiological *extension*. Do not confuse the words traction and extension, or substitute one for the other. Traction is the force which produces extension. The former is a cause, the latter an effect; the former is an active agent, the latter is a condition; or in other words, extension is a result of traction, and is the effect produced upon a joint by traction. The words are not synonymous, and should not be so employed. This principle of backward traction, by the weight of the upper extremities, is one which we have been utilizing lately, as a most satisfactory factor for the production of extension in Pott's disease, as we not only obtain as

much extension of the spine as we can by suspension (or traction by the lower extremity), but we obtain this in a backward direction, which enables us to apply leverage to obliterate the deformity to a more satisfactory extent than ever before, and with less discomfort to our patients.

We have now, by the use of the table, obtained great improvement in the condition of the deformity, and the question arises, how are we to retain this improvement



Fig. 3.

when the vertical position is again assumed, as the posterior spinal muscles are impaired and have not sufficient power to hold the spine in its restored curves.

Although in slight or recent cases this can be accomplished by simple methods, yet a brace will often be a necessity in severe cases, and it is easy for us to construct one upon the principles which govern the reduction of the deformity.

We must strive to keep the patient in a state of hyper-erectness until the muscles have contracted and been exercised and invigorated sufficiently to render the use of a brace unnecessary, and if we glance at Fig. 3, and turn it in such manner that the supine figure will appear vertical, it will be seen that the figure is more erect than normal, *i.e.*, hyper-erect, and this position (of the dorsal, not the cervical spine) is necessary to the development of the impaired muscles as well as for its effects upon the spine itself.

Now, how to keep this position with a brace. It may be, to some extent, done with a strong back-frame, fashioned to the hyper-erect shape and put in position and secured while the patient lies upon the table in the extension position. This frame may be made of some metal which can be bent by the hands of the surgeon, but it must necessarily be made of such heavy material as to be too cumbersome for general use, for it must be sufficiently firm to withstand the tendencies of the deformity, as it matches strength of material against the tendency of the superincumbent weight to fall forward.

I must impress upon you the importance of having this frame fashioned to the hyper-erect shape, for if so made, and well secured to the body, the forward tendency of the body and the exaggeration of the dorsal curve are to some extent prevented by the strength of material and shape of the splint.

A second and much more satisfactory method of utilizing the backward traction in the formation of a brace is one constructed on my adjustable lever plan—the *fulcrum*, F, to be over the sacrum—the *resistance*, R, to be greatest just below the central region of the dorsal curve, and distributed all along the spine below this region, and the *power*, P, to be the forward tendencies of the upper extremities and head (Fig. 4), so that while the body is maintained erectly no force is exerted upon the spine at any point; but the least tendency to rounding the shoulders brings a power to bear exactly opposed to

the power of the deformity, which increases automatically in proportion to the extent of the deformative force.

To construct a brace so as to bring the force to bear under these conditions we place a girth, provided with a sacral projection, about the hips (Fig. 5). From the upper edge of this hip-girth springs a pair of padded strips, one on each side of the median line, so as to avoid the spinous processes, and these strips extend upward to the

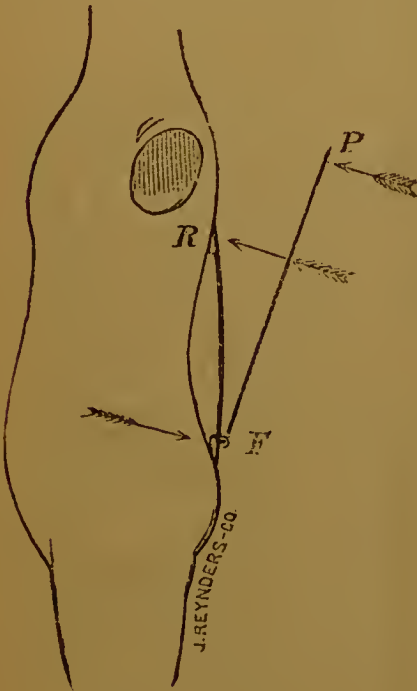


Fig. 4.

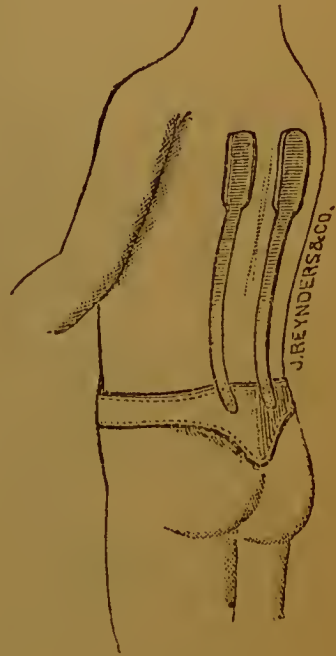


Fig. 5.

middle dorsal region (Fig. 5). So far the brace is a substitute for the table, but to give it efficacy we must supply a frame for backward traction as a substitute for the backward force exerted by the weight of the upper extremities when the body is in the traction position (see Fig. 3). To effect this, a light steel frame moulded to the shape of the back and extending from the sacrum to

the cervical vertebræ is attached at its lower extremity to the hip-girth (as in Fig. 6) and there provided with a ratchet which admits of its being secured at any angle. The upper extremity of this frame is secured to the body by means of chest and shoulder-bands (Fig. 7), which buckle in front to a firm leather chest-plate, the use of which permits us to avoid the constriction and discomfort attending the use of bands passing around the chest without such intervention.

The action of the brace (Fig. 7) is, as you see, that of

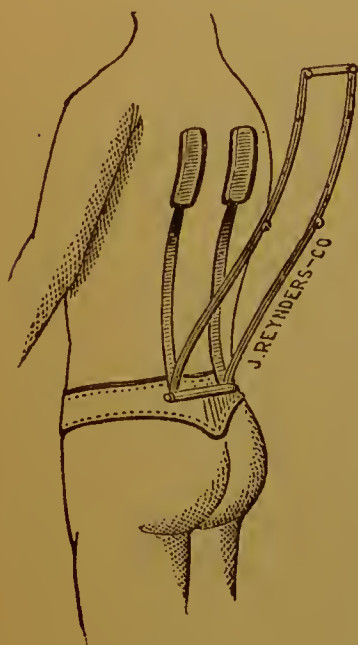


Fig. 6.

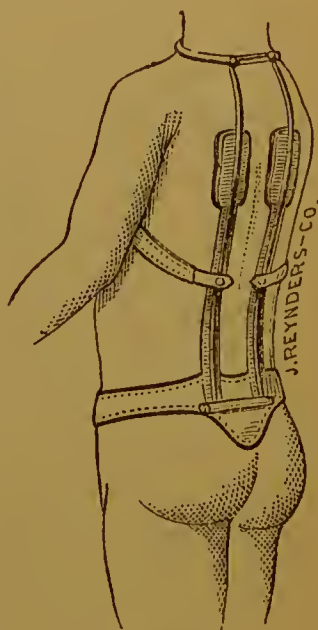


Fig. 7.

a lever, exerting its force in such a manner as to distribute its pressure along the spine and not at any one point; the dorsal centre being the point of greatest pressure, and the sacrum the least, the intermediate pressure being so graduated as to decrease from the dorsal centre to the sacrum. We thus see that direct pressure is provided to the greatest degree where it is

needed most, *i.e.*, at the dorsal centre, and in the least degree where it is needed the least, over the sacrum; and there is thus no portion of the spine below the dorsal centre without direct support. This support and forward pressure is just in proportion to the backward angle of the brace-frame and the forward tendencies of the deformity. In the beginning of the treatment this brace-frame may be secured at a considerable angle (Fig. 6), but as improvement ensues this may be lessened, until it lies flat upon the padded strips (Fig. 7) and becomes in its action a mere spinal support instead of a lever.

This brace makes an extremely effective and comfortable instrument, and can be made to exercise any desired degree of power on the deformity. But there are many cases which do not require so pronounced an instrument as this—cases in which the youth and immaturity of the patient have not as yet allowed the parts to become perpetuated in the abnormal curves to such an extent as to demand its use.

Such cases require merely a light, strong, compound spring, or pair of springs, which will act supplementary to the impaired muscles of the back, and if we can adapt this spring power to the form so that it will not be apparent to an observer that the patient is wearing an aid of this kind, so much more successful will we be in our practice. We must remember that this class of deformities is unattended by pain, and it is therefore desire for symmetry which brings them to you; so that if an unwieldy spring makes a protrusion along the course of the spine it would be an objection to treatment in the eyes of the patient. But it is possible, by incorporating into an ordinary well-fitting corset, a *pair* of compound springs, one on either side of the median line, to provide against the objection which attends the use of a single spring. The under springs are somewhat longer than the corset and are provided with pads at their extremities so as to allow sufficient grasp of surface to prevent the edges of the pads from digging into the flesh when the body is laced down

to the springs (see Fig. 8). The upper springs extend to the neck and are connected to the chest-plate in front as in the lever brace. The only springs which we have used heretofore in the profession to combat round

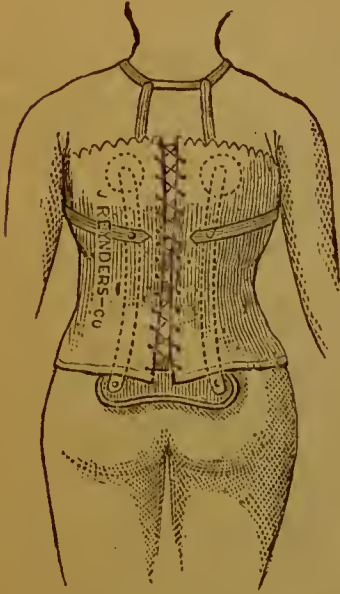


Fig. 8.

shoulders have been fashioned in an exaggeration of the normal curves of the spine—a shape which would tend to increase and intensify the abnormal curves which are symptomatic of the deformity.

To make round-shoulder springs effective, however, the curves of the under spring should be the reverse of the curves of the deformity—opposing apex to apex. Thus the curve of the deformity and the curve of the combating spring should be so placed in contact with each other that when the centres are together and the curves drawn tightly toward

each other there will be reduction in exaggerated curves of the spine as well as the curves of the spring.

The curve of the back springs are opposed to the curves of the back (see Fig. 9) before the stays are brought together, but when the corset is tightened and secured to the figure (Fig. 10), its action is to flatten the dorsal curve in direct proportion to the strength of the springs.

For males, corsets are not so applicable for obvious reasons, and we therefore provide the springs with girths in such a manner as to be as effective for the purpose intended. So much for the mechanical treatment.

The *physical* treatment next engages our attention, and by this we mean the employment of such exercises and movements during the mechanical treatment as will

conduce to the permanent cure of the deformity after the braces and corsets are thrown aside.

It is necessary in the first place to have a table, although a lounge or couch could be made to answer, the surface of which is padded or so covered as to be comfortable to the patient. This table should be a low one, so as to divest the patient of all fears of falling while undergoing treatment, and on such a table when the patient places himself there in the extension position—

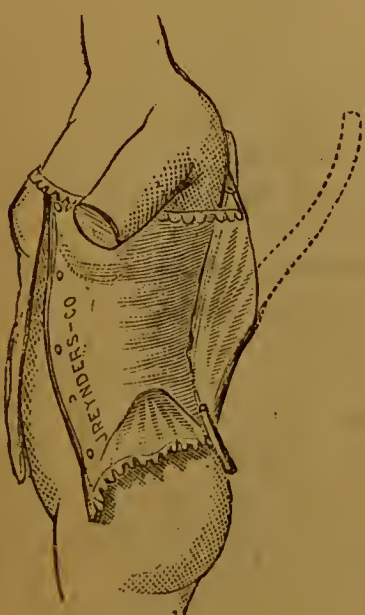


Fig. 9.



Fig. 10.

the edge of the table coming to the central dorsal region and the head and upper extremities hanging over—you will see that the chest has partially resumed its normal shape, that it has lost its contracted look, and that the shoulder-blades tend to approach each other. To approximate these it is necessary to clasp the hands together behind and under him—and at first this is almost an impossibility. When undergoing this process it would appear as if the skin and tissues of the anterior of the

thorax were stretched as much as their structure would allow, and that posteriorly the soft parts were redundant.

Dumb-bells of various weights are now taken in the hands and a series of rapid lateral movements practised which still further expand the chest. There are also quite a number of calisthenic exercises which are of advantage if practised in the backward traction position, but they must be employed with care and moderation, as their expanding effects are so powerfully augmented by gravity that they may strain the tissues painfully and thus delay treatment. A most useful agent is also found in the rubber-cord. Of these there should be two, fastened by detached hooks and staples to the floor in such a manner as to draw the hands beyond each other, the resistance of the muscles to the contractility of the rubber constituting a most valuable agent for developing the chest if formulated into a series of exercises.

This backward traction position may seem harsh exercise to be daily indulged in by your patients, but it is the most efficacious plan of physical treatment, and will do the most good in the shortest time. There are, however, many lighter forms of exercise which may be utilized.

One which can be specially recommended for other than the backward traction position is one in which the chest is expanded by the body falling forward as much as the rubber cords grasped by the hands will allow, the feet not being moved and the head prevented from falling forward with the rest of the body (and thus the hyper-erect position maintained) by means of a wooden bar placed between the teeth and connected to a gymnastic frame by cord or wire. This is very serviceable also, in strengthening the muscles of the neck.

There are also certain postures which are of themselves beneficial, and should be recommended to your patients for their adoption.

The *first* is in regard to sleeping. Have both bolster and pillow removed from their usual place under the head, and have one or both placed under the shoulder-

blades. This brings the head a little below the level of the dorsal region and curves the spine in direct reversal to the curves of the round shoulders ; and as, during sleep, relaxation of the spine ensues, the posterior spinal muscles are permitted to recover some of the contractility they lose during the day if proper supports be not worn.

The *second* is that of reclining (not upon the back but upon the front of the body) during the day for reading or resting, the patient lying at full length and resting on the elbows. This is a favorite position with children and should be encouraged, as, if steadily practised, it is a sure preventive of the deformity. But many parents, instead of encouraging this trait, rebuke their children for it, and sharply order them to get up from the floor. If they could only be made to understand that it is one of the greatest helps to symmetrical development they would be more inclined to encourage its practice.

